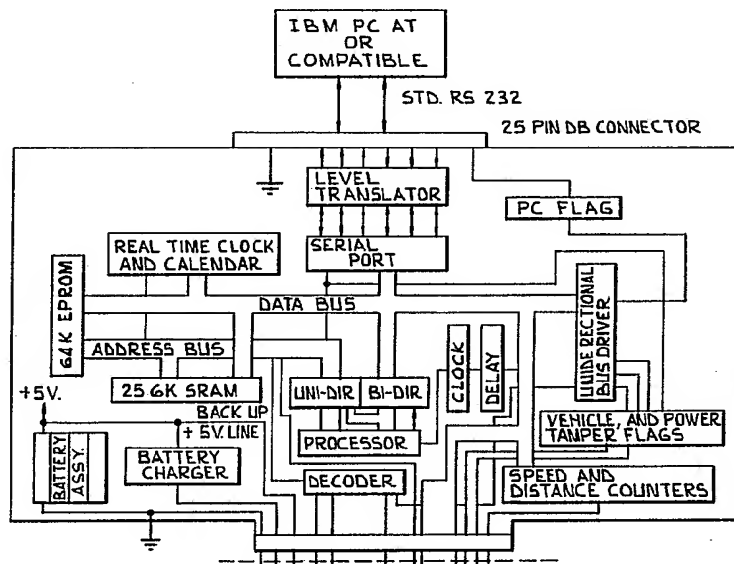




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : G06F 13/00	A1	(11) International Publication Number: WO 93/21583 (43) International Publication Date: 28 October 1993 (28.10.93)
(21) International Application Number: PCT/US92/02968 (22) International Filing Date: 13 April 1992 (13.04.92) (71) Applicant (for all designated States except US): VEHICLE COMPUTER CORPORATION [US/US]; 8200 N.W. 27 Street, Suite 114, Miami, FL 33122 (US). (72) Inventor; and (75) Inventor/Applicant (for US only) : PARRA, Pedro, S. [US/US]; 8200 N.W. 27 Street, Suite 114, Miami, FL 33122 (US). (74) Agent: SANCHELIMA, Jesus; Sanchelima and Associates, 235 S.W. Le Jeune Rd., Miami, FL 33134 (US).		(81) Designated States: AU, BR, CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE). Published With international search report.

(54) Title: A SYSTEM FOR MEASURING AND RECORDING DATA FOR A MOTOR VEHICLE



(57) Abstract

A device (10) for measuring and recording accurate, complete, dated and timed history for the moving speed of a specific motor vehicle. The device (10) includes a removable section (12) and a fixed section (14) identified by a unique code number stored in memory. Device (10) is micro-processor based, bus compatible with personal computers and features low power consumption to allow back-up battery operation during vehicle power source interruptions. Transducer interface circuit (20) picks up pulses that are proportional to the distance traveled. Speed and distance counters receive these pulses and send this information to the data bus. Memory (156) and processor (150) process and store the speed history of the vehicle being monitored, along with other information such as when and for how long the ignition circuit of the vehicle is activated.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BB	Barbados	GB	United Kingdom	NL	Netherlands
BE	Belgium	GN	Guinea	NO	Norway
BF	Burkina Faso	GR	Greece	NZ	New Zealand
BG	Bulgaria	HU	Hungary	PL	Poland
BJ	Benin	IE	Ireland	PT	Portugal
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SK	Slovak Republic
CI	Côte d'Ivoire	LJ	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	MC	Monaco	TG	Togo
DE	Germany	MG	Madagascar	UA	Ukraine
DK	Denmark	ML	Mali	US	United States of America
ES	Spain	MN	Mongolia	VN	Viet Nam
FI	Finland				

I. TITLE:

"A SYSTEM FOR MEASURING AND RECORDING DATA FOR A MOTOR VEHICLE"

II. TECHNICAL FIELD

This invention relates to a low power portable device for measuring and recording date, time, motor vehicle speed, distance traveled and identifying vehicle code number over a continuous basis over an extended period of time to document the activities of the vehicle.

III. BACKGROUND ART

Applicant believes that the closest reference correspond to U.S. Patent No. 4,344,136 issued to Panik and No. 4,697,278 issue to Fleischer. However, Panik differs from the present invention because it fails to record the date and time of events, namely, the speed of the vehicle, in continuous manner as to provide a complete history of the speed of the vehicle. Further, it does not record the identity of a vehicle being monitored.

Other patents describing the closest subject matter provide for a number of more or less complicated features that fail to solve the problem in an efficient and economical way. None of these patents suggest the novel features of the present invention.

IV. SUMMARY OF THE INVENTION

It is one of the main purposes of the present invention to provide a device that can document the speed of a vehicle along a continuous period of time and continuously providing said speed value at any given time.

It is another object of this invention to store the information stated in the previous paragraph in a digital storage memory assembly.

It is still another object of the present invention to provide a device that can accurately and reliably document the speed of a motor vehicle at any time during a predetermined period of time.

It is yet another object of this invention to provide a device that can be used to study and compare the driving habits of drivers and to more accurately derive inferences from the information obtained.

It is another object of this invention to provide a device that can only be used on a particular vehicle, and through pre-assigned passwords, determines, and records who drove the vehicle.

3

It is another object of this invention to provide a device that includes a back-up battery assembly that permits it to be disconnected from the vehicle's battery circuit without losing the information.

It is yet another object of this invention to provide a device that detects and records when electrical and/or mechanical connections and/or structures are interrupted or altered.

V. BRIEF DESCRIPTION OF THE DRAWINGS

With the above and other related objects in view, the invention consists in the details of construction and combination of parts as will be more fully understood from the following description, when read in conjunction with the accompanying drawings in which:

Figure 1 is a block schematic representation of the present invention showing the portable and non-portable assemblies with the connections to the vehicle speed transducer, to the vehicle battery and to the ignition cable at the bottom and the connections to a personal computer serial port at the top.

Figure 2 shows a block schematic of the vehicle and transducer interface shown in figure 1.

Figure 3 illustrates a schematic of the circuit used for processing the signals from the digital and analog transducers as well as the vehicle ignition circuits.

VI. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is generally referred to with numeral 10, as shown in Figure 1, and it basically includes two assemblies, namely a portable removable assembly 12 and a non-portable fixed assembly 14 that remains at all times attached to the motorized vehicle where it is installed. Portable assembly 12 is removably connected to a non-movable assembly 14 through connectors 115 and 15. Movable assembly 12 is also capable of being connected to personal computer P.C. In the preferred embodiment shown in figure 1 an RS232 serial port is used for this connection.

For assembly convenience, the portable section should be separated from the non-portable section of the black box. The non-portable section of the black box should be securely bolted to the vehicle chassis. Electrically, the non-portable section includes: a voltage regulator 13, non-volatile identification memory PROM 40, latch circuit 23, Serial Number LED 21, Contact LED 60 and 70, vehicle and transducer interface circuit 20, mating connector and socket 11 and 11' to the vehicle wiring. Mechanically, it provides a sturdy frame to which the portable section is securely attached.

As best seen in figure 2, vehicle and transducer interface circuit 20 includes transducer low pass filter 32, diode and schotby clamps 34, hysteresis comparator amplifier 36, debouncer circuit 38 providing a signal at point Z that is removably connected to speed and distance counter circuit 120.

5

Also, interface 20 includes vehicle ignition low pass filter 31, zener clamp 33 and diode 35. Furthermore, interface 20 includes in vehicle flag 37 which provides a signal to the portable section indicating that connection 15 and 115 are engaged. Finally, interface 20 includes a closed loop that detects when the vehicle ignition circuit is being tampered with and they are labeled as ignition connections 1 and 2 in figure 2.

The portable section can be programmed to work only with a given fixed or non-removable section. To implement this, the serial number of the portable section is required to match the serial number of the non-portable section and a recognition signed is sent from micro-processor 150 to the serial number LED circuit 21 in the non-portable section. The decoder in the portable section allows micro-processor 150 to enable the I.D. PROM, it learns the identity of the non-portable section. When micro-processor 150 enables latch circuit 23, the latter drives serial number LED circuit 21 making it flash for several seconds.

The portable section is enclosed in a metallic box which fits into the non-portable section in a drawer-like fashion, being kept in place by a security lock; it provides a carry-on handle for ease of transportation. Electrically, it includes an eight-bit micro-processor, 256K SRAM, 64K instruction PROM, real time clock and calendar, event counter, system static clock, serial controller interface, RS232 driver/receiver, bus drivers/receivers, glue logic, four 1.25 volt rechargeable batteries and mating connectors to the non-portable section and to the RS232 port of personal computer (P.C.).

6

When the batteries of the portable section are charged and a vehicle is ready for installation, the proper date and time, speed and distance equivalence factors, initial vehicle odometer mileage non-portable section and portable section identification numbers, and memory initialization conditions can be set using the appropriate software with the AT type P.C.

A properly initialized portable section will recognize and store the I.D. number of a non-portable section at the time and date that a mating occurs. Alternatively, with appropriate changes in the **PROM** software, it can be made to recognize a given I.D. number of the non-portable section before any recording of events begin. Recognition is signaled by means of a flashing LED for approximately 10 seconds.

When the portable section is plugged into the non-portable section, the former's batteries are being charged, preferably with the Trickle Charge Method, through a battery charging network driven by the voltage regulator in the non-portable section fed by the vehicle battery.

The portable section "recognizes" when it is connected to the non-portable section or to the P.C. RS232 terminal. It also "recognizes" when the vehicle battery or the ignition wire are disconnected and reconnected. The portable section can also infer when the vehicles's transducer terminals are disconnected. When plugged into the non-portable section in the proper manner, two LED's are lit on a continuous basis. Whenever a disconnection or re-connection is detected, the corresponding time and date are stored. In addition, the

7

non-portable section I.D. number is fetched after reconnection for storage and/or comparison, depending on the instructions in the software used.

When the portable and non-portable section are properly mated in the vehicle, all motion events (or lack of motion) will be detected, analyzed, evaluated, timed and dated to provide interpreted information relevant for management and supervision of vehicle and driver activities. Only data which is considered of management interest will be stored; the remaining data will be discarded to save storage memory space. In general, one month's worth of data will be retained in RAM memory. Long range historical Data can be stored in P.C. memory and hard disk. Information is retrieved and stored into P.C. by unplugging the portable section from the non-portable section and connecting it to the RS232 terminal of a P.C. through the appropriate interface cable. Suitable P.C. software can be used to organize and display the information in a meaningful format.

If the batteries contained in the portable section must be replaced, all information contained in this section's memory must be transferred to P.C. (personal computer) memory. Otherwise, data not previously transferred and stored in the P.C. recorded will be permanently lost. After battery replacement, the clock/calendar and SRAM in the portable section must be reset with the appropriate P.C.-based initial installation software.

The operation of the present invention can be generalized to work in the following manner. When the vehicle where the present invention is utilized is in motion, analog speed transducer T produces

8

a number of wave forms per unit of time which is proportional to the rotational speed of the drive shaft which are in turn proportional to the speed of the vehicle. The output of transducer T is sent to transducer interface circuit 120 in non-movable assembly 14 which amplifies and provides predetermined suitable voltage levels for subsequent processing of this information. When a digital transducer is used, its output is directly wired to a debouncing circuit, bypassing the amplifiers clamping circuit and filter. Thirty-two bit speed and distance counter 120 is connected to the output of transducer interface circuit 20 through connectors 15 and 115 to count the number of pulses generated within a predefined sampling period. In this manner, the speed value at a particular moment is obtained, by counting the number of pulses detected in a short time intervals (normally every second).

In addition, the change in pulse count between predefined events and the cumulative count of the distance counter yields the distance traveled between events by the vehicle being monitored and its cumulative odometer reading respectively.

When presence or absence of the motion induced pulses described above are used in conjunction with the voltage sensed by the ignition wire connection, accurate conclusions can be reached regarding a driver's habits and usage of the vehicle being monitored. Precision, real time clock and calendar circuit 140 is implemented, preferably with OKI Semiconductor M6242B (Real Time Clock/Calendar I.C.), which is micro-processor compatible. The function of circuit 140 is to provide the appropriate date and time

9

when events pertinent to the vehicle's movement occur. It also identifies the time at which other events occur such as the removal and reconnection of portable section 12, or the interruption of the electrical connections of the vehicle. Time and date are also cross-referenced with total mileage and non-portable unit I.D. number is also stored and memory is compared for a match upon plug-in of the portable section to the non-portable section in the vehicle, as previously described. The non-portable section 14 is preferably assigned a unique identification number or information that can be required to match an interrogation from portable section 12 before it operates.

Micro-processor 80c88 150 is paced by an 82c85 static clock 160 and provides the "decision making" capability within the system. It takes Initial and subsequent instruction from a non-volatile 64K EPROM circuit 154 and stores/retrieves data and instructions into/from a 256K SRAM (static RAM) memory circuit 156.

The RS232 computer interface is implemented with an 82c52 UART (Universal Asynchronous Receiver and Transmitter) 158 and a MAX 235 device 159 (manufactured by Maxim Co) both of which provide the required capability for exchanging serial information between portable assembly 12 and a personal computer.

Low power dissipation is critical for proper performance of this system because of its back-up battery operation requirement. Accordingly, CMOS is the preferred technology due to its static operation capability and its inherent low power performance.

ASSEMBLY AND START-UP PHASE

Transducer T is connected to the vehicle transmission or to the speedometer cable in a manner well known in the vehicle instrumentation industry so that electrical pulses are generated as the vehicle drive shaft turns. The output terminal of the speed/distance transducer T is connected to either the digital input terminal or the analog input terminal in connector assembly 11 depending on the nature of the transducer. Wires connected to the vehicle's battery terminals are also connected through connector 11, to non-portable section 14 to power up the voltage regulator 13. This regulator 13 provides regulated power to all electronic components under normal operating conditions. The last connections made to non-portable section 14 are the ignition line voltage and the ignition disconnect sensing wire. Good engineering practice dictates the use of appropriate shielding techniques to minimize unwanted electrical noise disturbance of the desired signal.

VII. INDUSTRIAL APPLICABILITY

The availability of a device for continuously and selectively recording the speed history of a vehicle and the distance traveled by such vehicle is quite desirable. Such a device is useful for individuals responsible for the operation of large fleets who could then characterize the actions of the drivers over predetermined periods of time. The information can also be processed in order to make pertinent statistical inferences.

The foregoing description is believed to convey the best understanding of the objectives and advantages of the present invention. Different embodiments may be made of the inventive concept of this invention. It is to be understood that all matter disclosed herein is to be interpreted merely as illustrative, and not in a limiting sense.

VIII. CLAIMS

What is claimed is:

1. A micro-processor based system for measuring and recording dated and timed history for the moving speed of a specific motor vehicle having first battery means and an ignition circuit and a drive axle and including a fixed section having sensing means to detect the rotation of the drive axle in said vehicle and including an output that generates electrical pulses in proportion to the rate of rotation and said fixed section having interface means for shaping and filtering said pulses having an input connected to the output of said sensing means and also including an interface means output so that said pulses produce a signal on the output of said interface means and said interface means being powered by said first battery means and said system further including a removable section, comprising:
 - A. means for counting the pulses on said interface means' output and being connected to the output of said interface means and including a counting means' output;
 - B. micro-processor means including clock means and data bus means connected to said counting means output so that the outputs from said means for counting said pulses can be processed by said micro-processor means;
 - C. real time clock and calendar means including a real time clock means' output connected to said data bus means;

- D. first memory means for storing data and programming instructions having a memory means' output connected to said data bus and connected to said micro-processor means and having sufficient capacity to store the necessary program instructions to cause said micro-processor means to read the outputs of said means for counting said pulses and real time clock means selectively and to periodically record the information obtained from said means for counting said pulses and real time clock means over a given time period thereby storing a measurement for traveled distance and speed at a given time;
- E. second battery means for powering said means for counting, micro-processor means, real time clock and calendar means and first memory means; and
- F. means for accessing and transferring said stored information wherein said interface means is permanently mounted to said vehicle thereby defining a fixed section of said device and said means for counting said pulses, micro-processor means, real time clock means, first memory means, means for accessing and transferring said stored information are removably mounted and connected to said interface means thereby defining a removable section of said device.

2. The device set forth in claim 1 wherein said fixed section includes second memory means for storing predetermined identification information and said removable section including means for detecting said predetermined identification information.

14

3. The device set forth in claim 2 wherein said first memory means includes non-volatile means for storing program instructions.

4. The device set forth in claim 3 wherein said second memory means includes non-volatile means for storing said identification information.

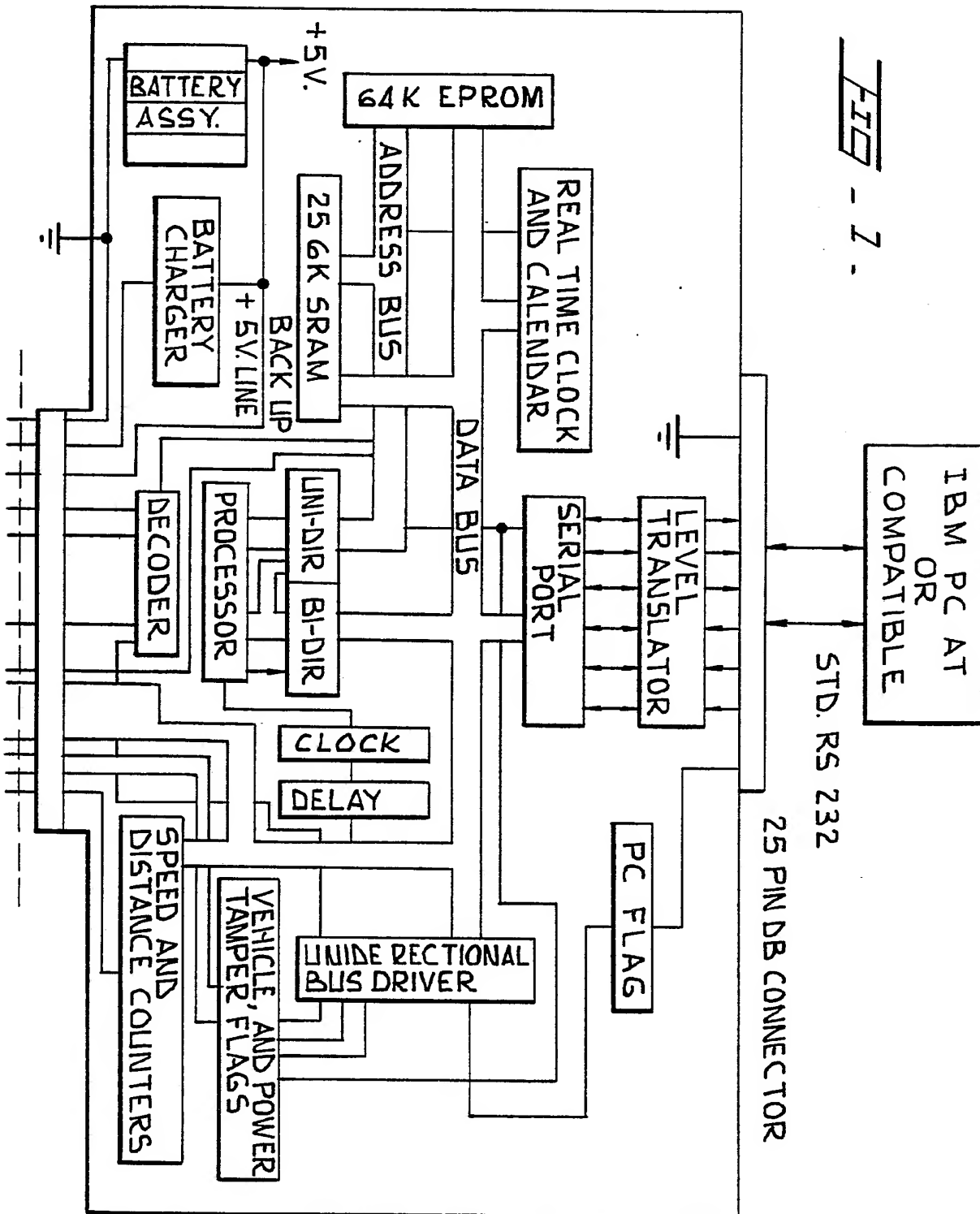
5. The device set forth in claim 4 wherein said removable section further includes means for detecting engagement and disengagement from said fixed section and means to record in said first memory means when said engagement and disengagement occurred.

6. The device set forth in claim 5 wherein said removable section includes means for detecting the activation of the ignition circuit in said vehicle and means to record in said first memory means when said activation occurred and ceased.

7. The device set forth in claim 6 wherein said first memory means includes further program instructions that cause said micro-processor to store in said first memory means non-zero outputs and a predetermined number of zero outputs before an at-rest code is stored thereby minimizing the use of storage capacity in said first memory means when said vehicle is idle over a predetermined amount of time.

8. The device set forth in claim 7 wherein said microprocessor can be programmed to selectively store non-zero within predetermined threshold.

1/3



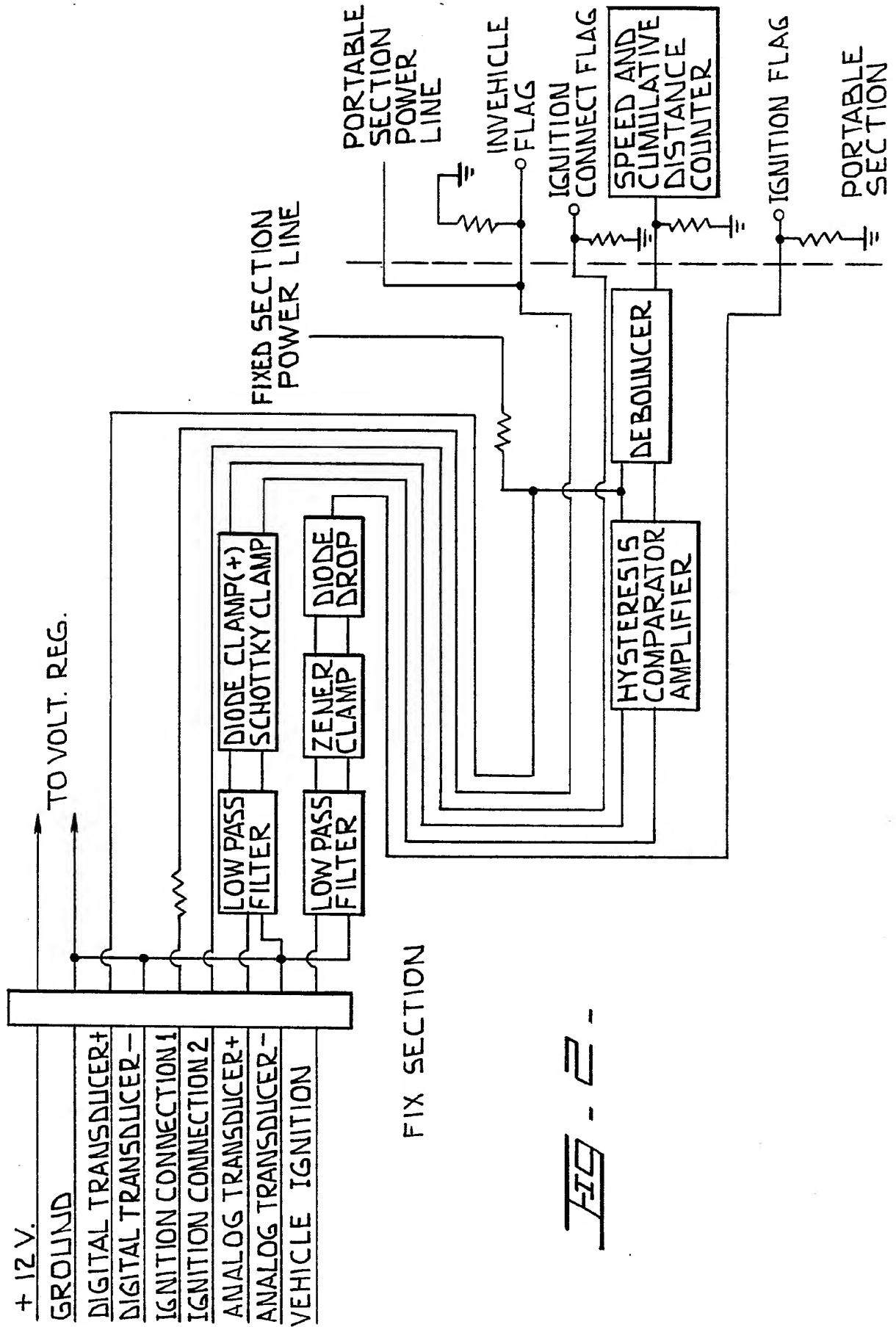
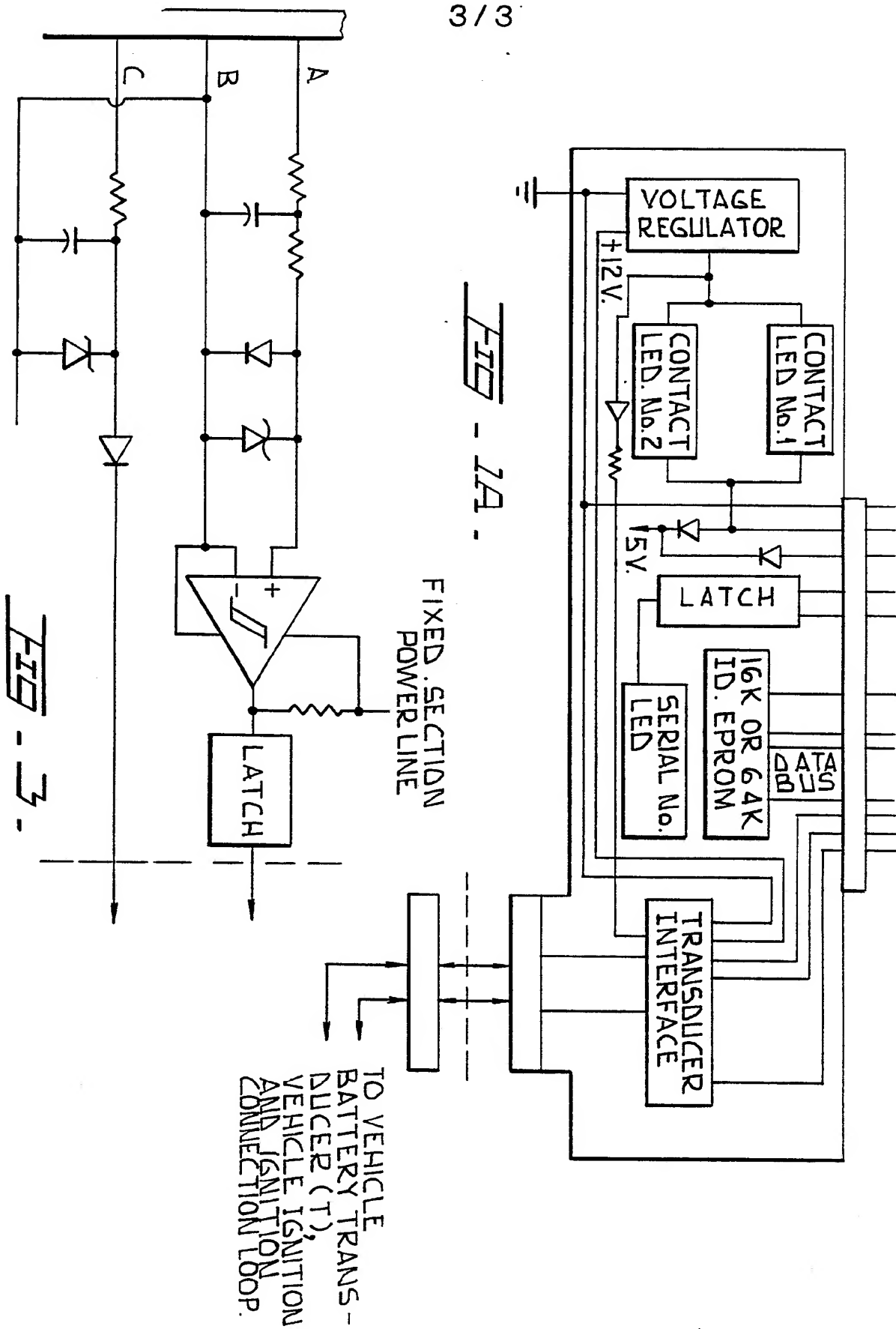


FIG - 2 -

3 / 3



INTERNATIONAL SEARCH REPORT

1. national application No.
PCT/US92/02968

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G06F 13/00

US CL :364/424.03, 424.04; 377/24.1; 340/438

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 364/424.03, 424.04; 377/24.1; 340/438 364/424.01,561 ; 377/24,26 ; 340/439

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A, 4,939,652 (Steiner) 03 July 1990 See the entire document.	1-8
A	US,A, 4,638,289 (Zottnik) 20 January 1987 See Fig. 1.	1-8
A	US,A, 4,853,856 (Hanway) 01 August 1989 See Fig. 2.	1-8
A	US,A, 4,685,061 (Whitaker) 04 August 1987 See the entire document.	1-8
A	US,A, 5,046,007 (McCrery et al.) 03 September 1991 See Fig. 2.	1-8
A	US,A, 4,992,943 (McCracken) 12 February 1991 See Fig. 4.	1-8

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

07 AUGUST 1992

Date of mailing of the international search report

08 OCT 1992

Name and mailing address of the ISA/
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Authorized officer

GARY CHIN

Facsimile No. NOT APPLICABLE

Telephone No. (703) 308-1394